

REMARKS

Claims 1-9 and 13-45 remain in this application. Claims 10-12 have been cancelled. The examiner rejected claims 15, 17, 18, 21 and 31 under 35 U.S.C. § 102 as being anticipated by *Ortiz et al.* The examiner rejected claims 13 and 14 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *Terry et al* and *Newman*. The examiner rejected claims 15, 22, 23, 31-33, 37-39 and 41 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer*. The examiner rejected claims 1, 5-7, 9 and 26 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer* as applied to claims 15 and 31 above, and further in combination with *Morrison et al.* The examiner rejected claims 27-30, 34, 35 and 40 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, and *Morrison et al* as applied to claim 26 above, and further in combination with *Kanzaka et al.* The examiner rejected claims 2 and 8 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, and *Morrison et al.* as applied to claim 1 above, and further in combination with *Newman*. The examiner rejected claim 3 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, *Morrison et al.*, and *Newman* as applied to claim 2 above and further in combination with *Kanzaka et al.* The examiner rejected claim 4 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, and *Morrison et al* as applied to claim 1 above, and further in combination with *Endsley et al.* The examiner rejected claim 43 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, and *Morrison et al* as applied to claim 1 above, and further in combination with *Terry et al.* The examiner rejected claims 44 and 45 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, *Morrison et al* and *Terry et al.* as applied to claim 43 above, and further in combination with *Newman*. The examiner rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer* as applied to claim 15 above and further in combination with *Greenwood et al.* The examiner rejected claims 18-20 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer* as applied to claim 15 above, and further in combination with *Chiu et al.* The examiner rejected claims 24 and 25 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer* as applied to claim 15 above, and further in combination with *Newman*. The examiner rejected claim 42 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer* as applied to claim 31 above,

and further in combination with *Husseiny*. The examiner objected to claim 36 as being dependent upon a rejected base claim but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

I. CLAIM REJECTIONS – 35 U.S.C. § 102

A. Rejection of Claims 15, 17, 18, 21, and 31 Under 35 U.S.C. § 102(b) as Anticipated by *Ortiz*

The examiner rejected claims 15, 17, 18, 21, and 31 under 35 USC § 102(b) as anticipated by *Ortiz* (US Patent No. 4,988,875). *Ortiz* discloses an inspection system for insulated electrical cables having a polyethylene jacket made of a polyethylene polymer that is transparent or translucent to an impinging radiation. *Ortiz* discloses a system for inspecting the inside of the jacket for defects such as voids, bubbles, inclusions, contaminants, pits, or defects in the polyethylene. The metallic conductor within the jacket is opaque and will reflect any incident light beam. A source of white light 25 shines an incident beam of light 26 onto the cable. The opaque material within the transparent or translucent jacket reflects the incident light beam. The reflected light 30 is directed to an optical polarizer 32, a magnifying lens system 33, and a long passfilter 34 to a long wave length video camera 36. The signals received by video camera 36 are transmitted to a high resolution video monitor 40 for producing a visible image. Figure 11 discloses a motion detector circuit 112. A defect that shows in a screened image will cause a variation in the signals delivered from camera 36 to the motion detector circuit 112.

Claims 15 requires a plurality of imaging devices configured to capture video images of coiled tubing as the tubing passes in front of the imaging devices and a computer system configured to execute pattern recognition software to analyze each image separately, extract discrete anomalies from each image, and generate an indication if a discrete anomaly is identified as a defect in an image. Claim 31 similarly requires capturing images of the outer circumference of the tubing with the imaging devices and transmitting the images to a processor, receiving the images by the processor and inputting the images to computer vision software running on the processor, processing each image separately on the computer vision software, and identifying predetermined discrete anomalies in the tubing in each image. The computer analysis system in *Ortiz*, however, only compares changes in the video signal from one image to another and does not analyze individual images by themselves. *Ortiz* associates each video camera 36 with a motion

detector circuit 112.¹ The motion detector circuits determine whether or not there are any defects in the cable jacket as the cable passes the inspection station 110.² Each defect that shows in a screened image will cause a variation in the signals delivered from the relevant camera 36 to the associated motion detector circuit 112.³ Figure 12 of *Ortiz* even shows how the signal from the camera 36 changes with the occurrence of defects. *Ortiz* discloses that the motion detector circuits 112 detect the variations in the video signals.⁴ Thus, by varying the signal when there is a defect, *Ortiz* compares a signal from an image that is defect-free with the signal from an image containing a defect to detect the defect. *Ortiz* is not analyzing or processing the individual images separately as claims 15 and 31 require. In fact, *Ortiz* does not disclose analyzing or processing the images at all, but instead discloses comparing the signal generated by a cable free of defects with a cable having defects. The Examiner refers to Figure 7 and refers to the bubbles 75, 76, and 78 as anomalies. However, such anomalies are determined visually on video monitor 40 and not by computer analysis. The motion detector circuit 112 referenced at column 6, line 60, does not analyze or process the images. The motion detector circuit 112 only identifies a variation in the signals delivered from camera 36 to detector circuit 112. The Examiner refers to column 7, line 40 stating that the video data representing the defects is recorded electronically so as to include the speed of the cable, the location of the cable area being documented, and the cable identification number. No mention is made of computer analysis or processing of the image. Thus, contrary to the examiner's statement, *Ortiz* does not disclose all of the limitations of claims 15 and 31. Therefore, the rejection is unsupported by the art and should be withdrawn.

As claims 17, 18, and 21 depend either directly or indirectly from claim 15, *Ortiz* also does not disclose all of the limitations of claims 17, 18, and 21. Therefore, the rejection should be withdrawn from claims 17, 18, and 21 as well.

¹ *Ortiz*, column 6, lines 59-60.

² *Ortiz*, column 6, lines 60-62.

³ *Ortiz*, column 6, lines 63-65.

⁴ *Ortiz*, column 7, lines 7-8.

II. CLAIM REJECTIONS—35 U.S.C. § 103

A. Rejection of Claims 13 and 14 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *Terry et al.* and *Newman*

The examiner rejected claims 13 and 14 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *Terry et al.* and *Newman*. *Newman* teaches the use of a stripe only to measure the amount of rotation of the coiled tubing. That measurement is used either to operate the rotational control device 216 to achieve a more even wear of the tubing or the measurement is used with other measurements to calculate the fatigue on the coiled tubing. *Newman* does not teach the use of the stripe as a reference point for defects in the tubing and particularly to determine a circumferential position of a defect in reference to the stripe.

The examiner stated that it would have been obvious at the time the invention was made to one of ordinary skill in the art to utilize the tubing taught by *Terry*, as the tubing required by *Newman*, because it is "very strong" and "resistant to abrasion", thus preventing premature wear and failure due to continuous deployment into and out of wells. Regarding claim 14, the examiner stated that *Newman's* tubing has an outer layer, and *Newman's* outer layer has a predetermined color. The examiner stated that given that *Newman* analyzes the video images to detect the presence and location of the stripe, and given that the stripe is a predetermined color, then *Newman* naturally analyzes the video signal and detects the stripe color. The examiner believes that the computer 210 in *Newman* analyzes the image from the camera. The examiner stated that when *Newman* describes "sensor 100", sensing "rotation of the coil tubing", and "as described above", *Newman* refers directly to the aforementioned "camera" embodiment. The examiner stated that it is the computer 210 that does all of the analysis, including determining the location of the stripe. The examiner stated that *Newman* discloses a computer with modeling software at column 4, line 15, whereby the "computer system then uses this data to calculate amount of fatigue damage and deformation for various segments along the length of the coiled tubing" at column 4, line 24. The examiner asserted that "this data", in the embodiment where images of the stripe are captured, would have to be video or image data. The examiner stated that certainly *Newman* does not disclose any intermediate transformation of the data between the camera and the computer.

There is no *prima facie* case of obviousness because *Terry* and *Newman* fail to teach or suggest all of the limitations of the claims. Claims 13 and 14 require a processor receiving the video signals from the imaging device and a program in the processor analyzing the video signals

to detect the stripe on the tubing segment. The computer 210 in *Newman* is not a processor that receives the video signals from the imaging device. Instead, *Newman* discloses a computer 210 that analyzes a signal of logged numerical data from the data acquisition device 207.

Newman begins by differentiating recording rotation of the coiled tubing; *i.e.*, image data, with "amount of said rotation"; *i.e.*, a numerical value.⁵ Thus, as is normal and customary in engineering, *Newman* refers to measuring an amount, or numerical value, as being different from the "rotational orientation", or image data, of the coiled tubing. *Newman* continues with this theme by stating that the "present invention, in certain aspects, provides a coiled tubing measuring system for measuring rotational orientation of coiled tubing" and that such a system can take "discrete rotational measurements".⁶ Thus, *Newman* makes a clear differentiation between rotational orientation (visual) and taking a measurement (numerical) of the rotational orientation. *Newman* also states that the computer models according to the present invention use "these parameters, including rotation, to calculate the fatigue damage and predict the fatigue life..."⁷ Thus, *Newman* discloses that the computer models use the parameter, or numerical value, of rotation to conduct the calculations.

Newman continues to give insight as to how to determine amount of rotation by introducing another term "location":

The rotational orientation of the line, lines, or dots is monitored visually, with optical scanning device(s), or with camera(s) and the location from which amount of rotation can be calculated is logged manually or electronically.⁸

Thus, *Newman* discloses that the cameras monitor the rotational orientation of the coiled tubing and that the location of the line, lines, or dots is logged either manually or electronically. *Newman* also states that location is used to calculate amount of rotation. *Newman* thus also differentiates between the terms rotational orientation (visual) and location (numerical), or else *Newman* would describe the rotational orientation as being logged (if it could be), not the location. Because *Newman* differentiates between rotational orientation and location, *Newman* is using the term location to also describe the measurement, or numerical value, of the position of the line, lines, or

⁵ *Newman*, Abstract.

⁶ *Newman*, column 3, lines 19-22.

⁷ *Newman*, column 3, lines 28-32.

⁸ *Newman*, column 3, lines 42-46 (underlining added).

dots within the visual images. *Newman* also supports location being a numerical value by stating that it can be used to calculate amount of rotation.

Newman next introduces the data acquisition device 207. *Newman* describes the data acquisition device 207 as being, for example, an analog to digital signal converter and a microprocessor.⁹ *Newman* states that sensors measure rotational orientation of the coiled tubing (measurements inherently involving a numerical value) and then provide a signal indicative thereof to the data acquisition system that stores the data in a database.¹⁰ Thus, all of the rotational orientation measurement data is logged in the data acquisition device 207 as numerical data. The data acquisition device 207 then feeds this numerical data to the computer 210 for calculating amount of rotation.

The examiner states that *Newman* discloses a computer with modeling software at column 4, line 15, whereby the "computer system then uses this data to calculate amount of fatigue damage and deformation for various segments along the length of the coiled tubing" at column 4, line 24. The examiner asserts that "this data", in the embodiment where images of the stripe are captured, would have to be video or image data.

Applicants respectfully disagree. Understanding *Newman* once again requires analyzing the complete passage of which the examiner is only quoting a portion. The full passage actually supports that the sensors send measurement, or numerical, data relating to rotational orientation to the data acquisition device 207:

The sensor(s) measure rotational orientation of the coiled tubing in any combination with one, some or all of the following: its depth (length), weight (axial load while straight), internal pressure, reel back tension (axial load while bending), wall thickness diameter and ovality of the coiled tubing. The sensor(s) provide a signal indicative thereof to the data acquisition system which stores this data in a database. The computer system then uses this data to calculate the amount of fatigue damage and deformation for various segments along the length of the coiled tubing.¹¹

Again, *Newman* states that the sensors measure rotational orientation, thus indicating a numerical value. The phrase, "this data" is thus referring to logged numerical measurement data relating to

⁹ *Newman*, column 6, lines 29-31.

¹⁰ *Newman*, column 4, lines 17-24.

¹¹ *Newman*, column 4, lines 17-27 (underlining added).

the rotational orientation that is sent from the data acquisition device 207 to the computer 210. This is supported by the fact *Newman* uses the word measure, not monitor or record as described above.

The examiner also states that certainly *Newman* does not disclose any intermediate transformation of the data between the camera and the computer.

Applicants again respectfully disagree. In addition to the data acquisition device 207 being described as an analog to digital signal converter and a microprocessor, *Newman* further describes the data acquisition device 207 by stating that, in certain aspects, signals coming from the various sensors are analog or digital pulses and that the "data acquisition device 207 converts the electronic signals to "engineering" units such as feet, barrel per minute, etc.—digital data which a computer can read."¹² *Newman* in no way limits this statement to sensors other than the cameras. *Newman* continues to describe data acquisition 207 by stating that it is programmed with software that among other things converts signals to engineering units.¹³

Thus, the cameras monitor the visual rotational orientation of the coiled tubing and the location as expressed in numerical form of the line, lines, or dots is logged in the data acquisition device 207. The computer 210 then receives the logged numerical data from the data acquisition device 207 as engineering units, or numerical data, for analysis.

There is no prima facie case of obviousness because *Terry et al.* and *Newman* fail to teach or suggest all of the limitations of the claims. Specifically, *Terry et al.* and *Newman* fail to teach or suggest a processor receiving the video signals from the imaging device and a program in the processor analyzing the video signals to detect the stripe on the tubing segment. The computer 210 in *Newman* is not a processor that receives the video signals from the imaging device. Instead, *Newman* discloses a computer 210 that analyzes a signal of logged numerical data from the data acquisition device 207. Thus, combining *Terry et al.* with *Newman* would not teach the claimed invention. Therefore, the rejection is unsupported by the art and should be removed with respect to claims 13 and 14.

¹² *Newman*, column 7, lines 7-9.

¹³ *Newman*, column 7, lines 25-27.

B. Rejection of Claims 15, 22, 23, 31-33, 37-39, and 41 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.* and *Puffer*

The examiner rejected claims 15, 22, 23, 31-33, 37-39, and 41 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer*. Regarding claims 15, 22, and 31, the examiner stated that *McCoy et al.* discloses a system for surface inspection of a coiled tube being deployed by either injecting or removing it from a well. The examiner stated that while *McCoy et al.* is open to "any suitable type [of measurement apparatus] known in the art for taking the desired measurements", *McCoy et al.* does not teach all of the elements of the claims. The examiner stated, however, that *Puffer* discloses a system for inspecting an elongated tubular body in motion, comprising a plurality of image devices configured to capture video images of the tubing as the tubing passes in front of the imaging devices, transmitting the images to a processor, receiving the images by the processor, and executing pattern recognition to analyze images separately, extract discrete anomalies from each image, and generate an indication if a discrete anomaly is identified as a defect in the image. Regarding claim 23, the examiner stated that *Puffer* teaches a recorder.

McCoy et al. uses a sensor 52 that senses one or more characteristics of coiled tubing at a particular location. The characteristic is sent to a computer 54 which compares the specific output data obtained via the sensor 52 with a predetermined sequence of output data for determining whether the sequence and specific output data event correspond as compared to other coiled tubing. Once a comparison is made, an indicator is generated determining the status of the coiled tubing. The sensor is capable of identifying dents, wall thinning, cracks and fatigue lifetime of the tubing. *McCoy et al.* states that any type of measurement apparatus may be used for taking the desired measurements. Col. 5, l. 36. However, *McCoy et al.* does not teach a camera configured to capture video images and send those images to a processor for analysis using pattern recognition.

Puffer is similar to *Ortiz* in that *Puffer* monitors an article by using a white light and then monitoring the reflection of that light to determine defects. *Puffer* includes plurality of white light sources 26 that project a beam of light 28 onto the surface of cable 16. The light beams 28 cumulatively form an annular band 30 on the surface of cable 16 that is irradiated by the light. If a pip 22 appears in the coated cable in the irradiated band 30, the incident light will be scattered in numerous directions. A deflecting mirror 34 and an imaging lens 36 collects the scattered light and deflects that light onto an anti-blooming detector array 38. The detector array 38 is preferably of

the type possessing anti-blooming characteristics, such as a charge injection device (CID), having an array or matrix defining a large number of discrete picture elements, or pixels, for maintaining the fidelity of the image projected thereon. The detector 38 is connected to analytical electronics block 44. Analytical electronics block 44 includes scanning control electronics 45 providing a scanning raster for scanning the pixel outputs of detector 38. The scanned signal is extended to a slicer 48 that provides an output only if the intensity of the light signal for a respective pixel exceeds a threshold that is pre-selected to reject low-level light from acceptable cable surface. The output of the slicer 48 is transmitted to a counter 52 and a comparator 54. The counter 52 increments each time a pixel senses light above the threshold level and provides an output 55 to an alarm 56 each time a pre-selected count is reached. The count selected is indicative of a flaw such as a pip 22. Appropriate electronic processing could be used to monitor cable surface contour such as diameter or ellipticity.

There is no *prima facie* case of obviousness because *McCoy et al.* and *Puffer* fail to teach or suggest all of the limitations of claims 15, 22, 23, 31-33, 37-39, and 41. Specifically, *McCoy et al.* and *Puffer* fail to teach a plurality of imaging devices configured to capture video images of coiled tubing and a computer system configured to execute pattern recognition software.

Claim 15 requires a plurality of imaging devices configured to capture video images of coiled tubing as the tubing passes in front of the imaging devices and a computer system configured to execute pattern recognition software to analyze each image separately, extract discrete anomalies from each image, and generate an indication if a discrete anomaly is identified as a defect in an image. *Puffer* does not teach imaging devices configured to capture video image. First, *Puffer* does not disclose multiple imaging devices as Applicants have used the term. The examiner states that *Puffer* discloses imaging devices 34, 36, and 38, which are the mirror, imaging lens, and detector array, respectively. However, as Applicants have used the term, an imaging device is capable of producing an image by itself. The mirror, imaging lens, and detector array may be able to combine into one imaging device, but they are not individually capable of producing an image. *Puffer* even teaches away from having more than one imaging device:

The mirror 34 is conveniently a single U-shaped mirror which receives the cable 16 in the slot between the adjacent legs of the "U". The slot in the mirror 34 extends to the side of the cable 16 which is opposite to the direction in which light is reflected from the mirror toward detector 38 via the imaging lens 36, because the cable would shadow reflections from that location even if the slot were not there. Further, it is desirable that the slot extend upward from the lower edge of the mirror

34 to allow the cable 16 to droop or to fall free without contacting the optics, in the event cable tension is released.¹⁴

Thus, neither *Puffer* or *McCoy et al.* disclose or suggest plural imaging devices as required by claim 15. Second, *Puffer* does not disclose even one imaging device that is configured to capture video images. The examiner states that the images from the detector array 38 are captured video in that they are raster scanned. However, the examiner and *Puffer* state that it is the processor 44, with scanning control electronics 45, that provides a scanning raster for scanning pixel outputs of the detector 38. Thus, *Puffer* only discloses that the processor 44 captures video images of the coiled tubing, not the imaging device itself, as claim 15 requires.

Puffer also does not teach a computer system configured to execute pattern recognition software. *Puffer* teaches that the scanned signal from detector 38 is extended to slicer 48 that provides an output only if the intensity of the light signal for a respective pixel exceeds a threshold amount. The output of slicer 48 is extended to a counter 52 and a comparator 54. The counter 52 increments each time a pixel senses light above the threshold level. Thus, *Puffer* analyzes whether the light intensity of a given pixel exceeds a threshold amount. *Puffer* does not teach analyzing the image for any type of pattern. Pattern recognition software actually analyzes the pixels of an image as a whole to recognize patterns within the image. Therefore, *Puffer* actually teaches light intensity recognition software, not pattern recognition software. Thus, *Puffer* does not disclose pattern recognition software because its software only analyzes the light intensity of pixels individually and cannot perform image pattern recognition.

Claim 31 requires passing the continuous length of coiled tubing in front of a plurality of imaging devices, capturing images of the outer circumference of the tubing with the imaging devices and transmitting the images to a processor, receiving the images by the processor and inputting the images to computer vision software running on the processor, processing each image separately on the computer vision software; and identifying predetermined discrete anomalies in the tubing in each image. Applicants repeat the arguments made above for claim 15. As stated above, *McCoy et al.* and *Puffer* do not teach or suggest the required element of a plurality of imaging devices. In addition, *McCoy et al.* and *Puffer* do not teach or suggest capturing images of the outer circumference of the tubing with the imaging devices. Instead, the images in *Puffer* are

¹⁴ *Puffer*, column 5, lines 1-11.

captured by the scanning control electronics 45, which are part of the processor 44, not the imaging devices.

Thus, there is no prima facie case of obviousness for claims 15 and 31 because *McCoy et al.* and *Puffer* fail to teach or suggest all of the limitations of the claims. Therefore, the rejection is unsupported by the art and should be removed with respect to claims 15 and 31. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.¹⁵ As claims 22, 23, 32, 33, 37-39, and 41 depend either directly or indirectly from claims 15 or 31, claims 22, 23, 32, 33, 37-39, and 41 are not obvious. Therefore, the rejection should be withdrawn from claims 22, 23, 32, 33, 37-39, and 41 as well.

C. Rejection of Claims 1, 5-7, 9 and 26 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.*, *Puffer*, and *Morrison et al.*

The examiner rejected claims 1, 5-7, 9 and 26 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, and *Morrison et al.* The examiner stated that regarding claims 6 and 7, the *McCoy et al.* and *Puffer* combination teaches detecting discrete anomalies including cracks. The examiner stated that the *McCoy et al.* and *Puffer* combination also teaches a warning signal. The examiner states that the *McCoy et al.* and *Puffer* combination also teaches a video camera generating video signals and transferring those signals to subsequent processing for defect detection. The examiner states that the *McCoy et al.* and *Puffer* combination does not teach an image grabber input device receiving video signals and generating sequential images of the tubing surface from the video. The examiner states that *Morrison* discloses a defect detection system addressing the same problem of capturing and processing images of a moving object in the same manner that *Puffer* does, comprising an image grabber input device receiving video signals and generating sequential images of the moving object's surface from the video. Regarding claim 5, the examiner stated that the frame storage of *Morrison* stores subsequent frames, and is thus a stacker.

Morrison et al. discloses an assembly for determining the position of a rectilinear feature of an article as for example a width measurement and edge tracking system where the edges of a strip of steel are being trimmed to reduce the total strip width to a precisely known desired value. The apparatus includes a solid state array camera and lens combination 6 including a two-dimensional orthogonal array of individual radiation responsive elements, each of which gives a voltage signal

proportional to the incident light intensity. The video camera is a charge coupled device (CCD) that includes a radiation-responsive sensor of the kind comprising a solid state orthogonal array of radiation sensitive elements arranged in rows and columns and corresponding in number and disposition to the pixels of a video image to determine the position of a rectilinear feature of an article causing an abrupt change in the brightness of the camera's field of view. The camera sends a video stream of information from the two-dimensional orthogonal array of rows and columns one row at a time. At the end of each row there is a synchronization pulse that acts as a terminator for the old row and an initiator for the new row. The camera preferably uses ambient light. The video camera is connected to a frame grabber 9 comprising a digitizer and frame store. The frame grabber 9 is interfaced with an appropriate computer 10 that is connected to a monitor 11. The vision processing means collects, stores, and analyzes the information provided by the camera. The vision processing means digitizes the information from the camera into a large range of numbers representing brightness or grey level. The information from the digitizer is stored in a dedicated area of memory called a frame store. In operation, an image of the strip is produced on the sensor array, transmitted by the camera as a video signal. This signal is then converted to a digital signal that is stored in a computer. The data is transferred to an appropriately sized array in the computer memory, the files (rows and columns) of which correspond to those of the sensor elements and of the original picture captured by the camera. Summing all the horizontal rows produces a linear array of summation values in which the values are allocated to positions corresponding to the positions along the perpendicular axis of the CCD array of sensor elements of the rows of elements from which the values were derived. A position algorithm recognizes the edges of the strip from the relatively small scale derived radiation profile. The edge positions are then passed to a precise position algorithm where further grey scale sums are calculated to produce further linear arrays of summation values defining large scale derived radiation profile relevant to the respective edges of the strip 7. From the edge positions, the strip width can then be calculated. The actual position of the strip edge from a reference point can also be calculated.

There is no *prima facie* case of obviousness because *McCoy et al.*, *Puffer*, and *Morrison et al.* fail to teach or suggest all of the limitations of claims 1, 5-7, 9, and 26. Specifically, *McCoy et al.*, *Puffer*, and *Morrison et al.* fail to teach a program in the processor configured to execute

¹⁵ MPEP § 2143.03.

pattern recognition software and analyze each image separately to detect discrete anomalies of the tubing segment.

Claim 1, as amended, is distinguishable from the cited prior art. Claim 1 requires an imaging device recording video signals of a segment of the coiled tubing as the coiled tubing is being injected into or removed from the well, a conductor transmitting the video signals to an image grabber, the image grabber generating images of the tubing segment from the video signals, and a program in the processor configured to execute pattern recognition software and analyze each image separately to detect discrete anomalies of the tubing segment. Applicant repeats the arguments made above for the *McCoy et al.* and *Puffer* references. *McCoy et al.* and *Puffer* also do not teach an imaging device recording video signals. *McCoy et al.* and *Puffer* also do not teach any form of image grabber. *McCoy et al.*, *Puffer*, and *Morrison et al.* also do not teach a program in the processor configured to execute pattern recognition software and analyze each image separately to detect discrete anomalies of the tubing segment. Applicants have already addressed *McCoy et al.* and *Puffer*. In addition, *Morrison et al.* teaches a frame grabber 9 that digitizes the information from the camera into a large range of numbers representing brightness or grey scale level of the camera's light responsive elements and stores the information in a frame store. *Morrison et al.* then teaches that the processor sums up all the numerical values of each of the horizontal rows to produce a linear array of summation values allocated to positions corresponding to the positions along the perpendicular axis of the CCD array of sensor elements. The summation values can then be used by the processor to determine the positions of the edges of the article by detecting a sufficient enough change in value from one summation value to the next. Thus, *Morrison et al.* does not teach a program in the processor configured to execute pattern recognition software and analyze each image separately to detect discrete anomalies of the tubing segment. Instead, the processor in *Morrison et al.* only analyzes the sum of the gray scale values of the sensor elements of each row to determine the relative position of the edge of the article. *Morrison et al.* cannot analyze the image for any type of pattern. Nor can *Morrison et al.* detect discrete anomalies of the tubing segment.

Claim 26 requires a pattern classification software program configured to read each image separately and extract discrete anomalies of the tubing from the images and compare the size of these discrete anomalies against user-defined thresholds, wherein if the pattern classification software determines that the size of the discrete anomalies does not fall within the user-defined

threshold, the software generates an interrupt indicating that a defect has been located. Applicants repeat the arguments made above for claim 1. *McCoy et al.*, *Puffer*, and *Morrison et al.* do not teach a pattern classification software configured to extract discrete anomalies of the tubing from the images and compare the size of the discrete anomalies against user-defined thresholds. Although *Puffer* teaches analyzing the light intensity of each pixel against a user-defined threshold, this is not pattern classification. Nor does *Puffer* teach extracting the discrete anomaly from the image and comparing the size of the entire discrete anomaly against a user-defined threshold.

Thus, there is no prima facie case of obviousness for claims 1 and 26 because *McCoy et al.*, *Puffer*, and *Morrison et al.* fail to teach or suggest all of the limitations of the claims. Therefore, the rejection is unsupported by the art and should be removed with respect to claims 1 and 26. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.¹⁶ As claims 5-7, and 9 depend either directly or indirectly from claim 1, claims 5-7, and 9 are also not obvious. Therefore, the rejection should be withdrawn from claims 5-7, and 9 as well.

D. Rejection of Claims 27-30, 34, 35 and 40 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.*, *Puffer*, and *Morrison et al.* as Applied to Claim 26, and further in Combination with *Kanzaka et al.*

The examiner rejected claims 27-30, 34, 35, and 40 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, and *Morrison et al.* as applied to claim 26 above, and further in combination with *Kanzaka et al.*

Applicants repeat the arguments made above for claims 26 and 31. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.¹⁷ As claims 27-30, 34, 35, and 40 depend directly or indirectly from either claim 26 or 31, claims 27-30, 34, 35, and 40 are also not obvious under 35 U.S.C. § 103(a). Therefore, the rejection should be withdrawn with respect to dependent claims 27-30, 34, 35, and 40 as well.

¹⁶ MPEP § 2143.03.

¹⁷ MPEP § 2143.03.

E. Rejection of Claims 2 and 8 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.*, *Puffer*, and *Morrison et al.* as Applied to Claim 1, and further in Combination with *Newman*

The examiner rejected claims 2 and 8 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, and *Morrison et al.* as applied to claim 1, and further in combination with *Newman*.

Applicants repeat the arguments made above for claim 1. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.¹⁸ As claims 2 and 8 depend directly or indirectly from claim 1, claims 2 and 8 are also not obvious under 35 U.S.C. § 103(a). Therefore, the rejection should be withdrawn with respect to dependent claims 2 and 8 as well.

F. Rejection of Claim 3 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.*, *Puffer*, *Morrison et al.*, and *Newman* as Applied to Claim 2, and further in Combination with *Kanzaka et al.*

The examiner rejected claim 3 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, *Morrison et al.*, and *Newman* as applied to claim 2, and further in combination with *Kanzaka et al.*

Applicants repeat the arguments made above for claim 1. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.¹⁹ As claim 3 depends directly or indirectly from claim 1, claim 3 is also not obvious under 35 U.S.C. § 103(a). Therefore, the rejection should be withdrawn with respect to dependent claim 3 as well.

G. Rejection of Claim 4 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.*, *Puffer*, and *Morrison et al.* as Applied to Claim 1, and further in Combination with *Endsley et al.*

The examiner rejected claim 4 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, and *Morrison et al.* as applied to claim 1, and further in combination with *Endsley et al.*

¹⁸ MPEP § 2143.03.

¹⁹ MPEP § 2143.03.

Applicants repeat the arguments made above for claim 1. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.²⁰ As claim 4 depends directly or indirectly from claim 1, claim 4 is also not obvious under 35 U.S.C. § 103(a). Therefore, the rejection should be withdrawn with respect to dependent claim 4 as well.

H. Rejection of Claim 43 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.*, *Puffer*, and *Morrison et al.* as Applied to Claim 1, and further in Combination with *Terry et al.*

The examiner rejected claim 43 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, and *Morrison et al.* as applied to claim 1, and further in combination with *Terry et al.*

Applicants repeat the arguments made above for claim 1. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.²¹ As claim 43 depends directly from claim 1, claim 43 is also not obvious under 35 U.S.C. § 103(a). Therefore, the rejection should be withdrawn with respect to dependent claim 43 as well.

I. Rejection of Claims 44 and 45 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.*, *Puffer*, and *Morrison et al.*, and *Terry et al.* as Applied to Claim 43, and further in Combination with *Newman*

The examiner rejected claims 44 and 45 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.*, *Puffer*, and *Morrison et al.*, and *Terry et al.* as applied to claim 43, and further in combination with *Newman*.

Applicants repeat the arguments made above for claim 1. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.²² As claims 44 and 45 depends directly or indirectly from claim 1, claims 44 and 45 are also not obvious under 35 U.S.C. § 103(a). Therefore, the rejection should be withdrawn with respect to dependent claims 44 and 45 as well.

²⁰ MPEP § 2143.03.

²¹ MPEP § 2143.03.

²² MPEP § 2143.03.

J. Rejection of Claim 16 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.* and *Puffer* as Applied to Claim 15, and further in Combination with *Greenwood et al.*

The examiner rejected claim 16 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer* as applied to claim 15, and further in combination with *Greenwood et al.*

Applicants repeat the arguments made above for claim 15. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.²³ As claim 16 depends directly or indirectly from claim 15, claim 16 is also not obvious under 35 U.S.C. § 103(a). Therefore, the rejection should be withdrawn with respect to dependent claim 16 as well.

K. Rejection of Claims 18-20 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.* and *Puffer* as Applied to Claim 15, and further in Combination with *Chiu et al.*

The examiner rejected claims 18-20 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer* as applied to claim 15, and further in combination with *Chiu et al.*

Applicants repeat the arguments made above for claim 15. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.²⁴ As claims 18-20 depend directly or indirectly from claim 15, claims 18-20 are also not obvious under 35 U.S.C. § 103(a). Therefore, the rejection should be withdrawn with respect to dependent claims 18-20 as well.

L. Rejection of Claims 24 and 25 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.* and *Puffer* as Applied to Claim 15, and further in Combination with *Newman*

The examiner rejected claims 24 and 25 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer* as applied to claim 15, and further in combination with *Newman*.

²³ MPEP § 2143.03.

²⁴ MPEP § 2143.03.

Applicants repeat the arguments made above for claim 15. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.²⁵ As claims 24 and 25 depend directly or indirectly from claim 15, claims 24 and 25 are also not obvious under 35 U.S.C. § 103(a). Therefore, the rejection should be withdrawn with respect to dependent claims 24 and 25 as well.

M. Rejection of Claim 42 Under 35 U.S.C. § 103(a) as Being Unpatentable Over *McCoy et al.* and *Puffer* as Applied to Claim 31, and further in Combination with *Husseiny*

The examiner rejected claim 42 under 35 U.S.C. § 103(a) as being unpatentable over the combination of *McCoy et al.* and *Puffer* as applied to claim 31, and further in combination with *Husseiny*.

Applicants repeat the arguments made above for claim 31. If an independent claim is nonobvious under 35 U.S.C. § 103, then any claim depending therefrom is nonobvious.²⁶ As claim 42 depends directly or indirectly from claim 31, claim 42 is also not obvious under 35 U.S.C. § 103(a). Therefore, the rejection should be withdrawn with respect to dependent claim 42 as well.

III. ALLOWABLE SUBJECT MATTER

The examiner objected to claim 36 as being dependent upon a rejected base claim but stated that claim 36 would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Applicants amend claim 36 into independent form to include all of the limitations of claim 31, the underlying base claim. Applicants respectfully request that the objection be removed and that the amended claim 36 be allowed.

IV. STATEMENT REGARDING CLAIMS

Applicants have argued the allowability of the claims by addressing the comments by the examiner in this paper as well as previously during the prosecution of this application. By doing so, Applicants are in no way limiting their ability to argue additional points of novelty regarding the independent claims or dependent claims at a later date.

CONCLUSION

²⁵ MPEP § 2143.03.

²⁶ MPEP § 2143.03.

Applicants respectfully request reconsideration the pending claims and that a timely Notice of Allowance be issued in this case. If the examiner feels that a telephone conference would expedite the resolution of this case, he is respectfully requested to contact the undersigned.

In the course of the foregoing discussions, applicants may have at times referred to claim limitations in shorthand fashion, or may have focused on a particular claim element. This discussion should not be interpreted to mean that the other limitations can be ignored or dismissed. The claims must be viewed as a whole, and each limitation of the claims must be considered when determining the patentability of the claims. There may also be other distinctions between the claims and the prior art that have yet to be raised, but that may be raised in the future.

If any fees are inadvertently omitted or if any additional fees are required or have been overpaid, please appropriately charge or credit those fees to Conley Rose, P.C. Deposit Account Number 03-2769 (ref. 1391-27300) of Conley Rose, P.C., Houston, Texas.

Respectfully submitted,
CONLEY ROSE, P.C.



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